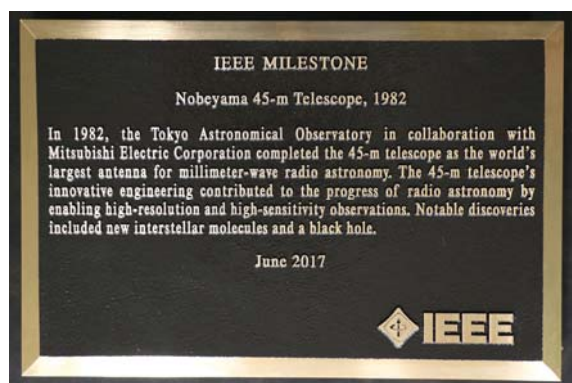


Nobeyama 45-m Radio Telescope Developed by the National Astronomical Observatory of Japan and Mitsubishi Electric Recognized as "IEEE Milestone"

Has contributed greatly to advancement of radio astronomy since debuting as the-world's largest millimeter-wave telescope

TOKYO, June 14, 2017 – National Astronomical Observatory of Japan (NAOJ) and Mitsubishi Electric Corporation (TOKYO: 6503) announced today that the Nobeyama 45-m Radio Telescope has been certified as an "IEEE Milestone" by the Institute of Electrical and Electronics Engineers (IEEE). The certification recognizes the many technical difficulties that were overcome to develop the world's largest millimeter-wave radio telescope at the time of its debut in 1982, leading to groundbreaking achievements such as the discovery of a supermassive black hole while continuing to perform as a world-leading radio telescope to the present day.

This is the NAOJ's first IEEE Milestone. The commemorative plaque presented by the IEEE will be exhibited at the NAOJ's Mitaka Campus, the Nobeyama Radio Observatory and Mitsubishi Electric Communication Systems Center.



In 1982, the Tokyo Astronomical Observatory in collaboration with Mitsubishi Electric Corporation completed the 45-m telescope as the world's largest antenna for millimeter-wave radio astronomy. The 45-m telescope's innovative engineering contributed to the progress of radio astronomy by enabling high-resolution and high-sensitivity observations. Notable discoveries included new interstellar molecules and a black hole.

IEEE Milestone commemorative plaque

The history of the Nobeyama 45-m Radio Telescope dates back to 1967. Millimeter waves were an unexplored field at the time, so there was a need to spectroscopically observe millimeter waves emitted from various molecules in the universe to explore new fields, such as the process of star formation and the structure of galaxies. The Nobeyama 45-m Radio Telescope was conceived as the world's largest telescope with a 45-meter diameter at a time when the world's largest radio telescope had a diameter of 11 meters.

Radio astronomers at the NAOJ (then Tokyo Astronomical Observatory) and engineers at Mitsubishi Electric conducted thorough discussions and studies on how to direct a large mechanical structure to a desired direction without deforming. The result was a variety of technological breakthroughs, including a

homologous design, master collimator and a method to suppress thermal deformation by covering the backup structure with insulation panels. These now-indispensable technologies are used widely in large telescopes and large antennas today.

After 35 years of operation, the Nobeyama 45-m Radio Telescope is still one of the world's top-performing radio telescopes for observing millimeter waves of around 3 mm in wavelength, showing how advanced the telescope's design was at the time of conception.

The NAOJ designs and constructs large astronomical research facilities for open-use programs contributing to further development of astronomy and society through sharing research results. Mitsubishi Electric develops advanced technology for the manufacture of large telescopes as scientific infrastructure that contributes to the advancement of society, including the Japan Meteorological Agency 's Mount Fuji Radar System (approved in 2000), KDDI's Pacific Crossing TV Satellite Relay (certified in 2009), and the MU radar together with Kyoto University (certified in 2015).

About IEEE and IEEE Milestone

The IEEE is the world's largest technical profession organization in the fields of electricity, electronics, information and communications. It is headquartered in the United States and had more than 420,000 members in over 160 countries, including 14,266 members in Japan, at the end of 2016. The IEEE Milestone program, founded in 1983 to honor historical achievements at least 25 years after their development, recognizes groundbreaking innovations in the fields of electricity, electronics, information and communications. The program raises awareness and appreciation of engineers by recognizing outstanding technological achievements that have had at least a regional impact.

Nobeyama 45-m Radio Telescope Specifications

Installation	Nobeyama Radio Observatory
Antenna system	Beam waveguide optics
Antenna diameter	45 meters
Surface accuracy	0.1 millimeter
Frequency	1 to 150 Gigahertz
Angular resolution	0.004°
Weight	Approx. 700 tons
Reference URLs	https://www.nro.nao.ac.jp/en/ http://www.nro.nao.ac.jp/~nro45mrt/html/index-e.html http://www.MitsubishiElectric.com/bu/space/ground/optical/index.html

Comments on Certification

Masahiko Hayashi, Director General of NAOJ, said: “It is a great honor for the National Astronomical Observatory of Japan to see the 45-m Radio Telescope at the Nobeyama Radio Observatory recognized as an IEEE Milestone. The 45-m Radio Telescope, Japan's first large-scale telescope project, has made groundbreaking achievements including the discovery of a supermassive black hole, and paved the way for the Subaru Telescope and the Atacama Large Millimeter/submillimeter Array. I express my gratitude to everyone who has supported us and I share this honor with them.”

Masaki Sakuyama, President & CEO of Mitsubishi Electric, said: “We are honored and take great pride in the 45-m Radio Telescope receiving a prestigious IEEE Milestone award. We deeply appreciate the National Astronomical Observatory of Japan for giving us the opportunity to help develop and manufacture this historic telescope. Mitsubishi Electric is an environmentally advanced company that contributes to sustainability through technological innovations for safety, security and convenience.”

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